

CURT EVERETT WHITMIRE

Northwest Fisheries Science Center, NOAA Fisheries, U.S. Department of Commerce
99 Pacific Street, Bldg. 255-A, Monterey, California, 93940
831.648.5336 | curt.whitmire@noaa.gov

EMPLOYMENT EXPERIENCE

CURRENT POSITION

Information Technology Specialist

Jan 2003 – present

Northwest Fisheries Science Center, NOAA Fisheries

I provide technical support for several programs in the Fishery Resource Analysis and Monitoring Division, conducting spatial analyses of data associated with Pacific coast groundfish surveys and assessments. Collaborating with scientists across NOAA and at academic research institutions, I help plan and conduct research expeditions using a SeaBED-class autonomous underwater vehicle (AUV), including participating in field research operations, choosing dive sites, writing mission plans, and processing AUV data streams. I am also part of a national working group that compiles information on deep-sea corals and other biogenic structure-forming invertebrates, in order to help inform conservation efforts of these vulnerable marine ecosystems.

PREVIOUS POSITION

Graduate Research Assistant, Oregon State University

Sep 2000 – Jan 2003

College of Earth, Ocean and Atmospheric Sciences

Co-Advisers: Robert Embley (NOAA PMEL), & Waldo Wakefield (NOAA Fisheries)

EDUCATION

FORMAL

Oregon State University, Corvallis, Oregon

Jun 2003

M.S., Marine Resource Management, College of Earth, Ocean and Atmospheric Sciences

“Integration of high-resolution multibeam sonar imagery with observational data from submersibles to classify and map benthic habitats at Heceta Bank, Oregon”

Minors in Fisheries and Earth Information Science and Technology

Arizona State University, Tempe, Arizona

May 1997

B.S., Biology, School of Life Sciences, College of Liberal Arts and Sciences

CONTINUING PROFESSIONAL EDUCATION

NOAA Diver

3-week training including fundamentals of diving and scientific and working diving

May 2016

Writing Advanced Geoprocessing Scripts Using Python

Environmental Systems Research Institute, Inc. (ESRI); 3-day workshop

Jun 2008

QTC Impact

Quester-Tangent Corporation; 2-day course

May 2008

Automation of Spatial Analytical Tasks Using Python Programming Language

Univ. of Washington, Spatial Analysis Lab; 3-hour workshop

Nov 2005

Multibeam Sonar Training Course

Univ. of New Brunswick, Ocean Mapping Group; 5-day course

Jan 2004

Introduction to SQL

Advanced Technologies Services, Inc.; 2-day course

Jan 2004

QUALIFICATIONS AND CERTIFICATIONS

TECHNICAL EXPERIENCE AND QUALIFICATIONS

- Adept at scientific writing in a variety of publications including peer-reviewed journals, NOAA technical memoranda, and reports to the Pacific Fishery Management Council
- Proficient in use of *Windows*, *Mac* and *Linux* operating systems
- Over 15 years of experience with geographical information systems (GIS) software and concepts.
- Extensive experience developing geoprocessing workflows for spatial data, including spatial modeling and geostatistical techniques
- Expert in use of *ArcGIS* Geographical Information Systems software suite and its application to a variety of spatial analysis workflows
- Considerable experience using visual programming languages, most notably *ArcGIS Model Builder*, to design and automate data processing workflows
- Proficient in scripting with *Python* programming language, and versed in others including *MATLAB* and *R*.
- Trained in many photo and video analysis techniques, including stereo camera calibration
- Familiarity with using various commercial and customized photo/video annotation software, including *Coral Point Count* (Kohler and Gill, 2006) and *VARS* (MBARI)
- Strong organizational skills including management of large geospatial datasets and creation of metadata
- Considerable familiarity with database design and the use of structured query language (SQL)
- Versed in experimental design, most notably stratified random sampling
- Over 15 years of shipboard field experience, including deploying/recovering advanced oceanographic gear (e.g., AUVs, ROVs)
- Almost 7 years of experience operating and maintaining a SeaBED-class AUV, including assembly, mission planning, and launch and recovery from various onshore and offshore platforms
- Previous web development experience including designing and maintaining a research project web site and writing daily expedition logs

CERTIFICATIONS

- NOAA Diver, including training and experience in both scientific and working diving
- NOAA *Nitrox*, *Dry Suit* and *Ship Husbandry* endorsements
- DAN *Diving First Aid for Professional Divers* and *Emergency Oxygen for Scuba Diving Injuries*

AWARDS

Department of Commerce Bronze Medal, 2008

"for advancing conservation through spearheading the first peer-reviewed assessment of the state of deep coral ecosystems of the United States"

Letter of Commendation from the Pacific Fisheries Management Council, Oct 2012

"for dedicated work supporting the Pacific Coast Groundfish Essential Fish Habitat Review"

GRANT SUPPORT

NOAA Deep-Sea Coral Research & Technology Program, FY2016

Co-Principal Investigator; wrote proposal and managing ongoing project \$23,620
"Enhancement of a coral and sponge field guide for the Pacific region"

NOAA Deep-Sea Coral Research & Technology Program, FY2011

Co-Principal Investigator; wrote proposal and managed project to completion \$15,889
"Analyzing coral bycatch information in the context of bottom trawling intensity off the U.S. West Coast"

NOAA Deep-Sea Coral Research & Technology Program, FY2009

Co-Principal Investigator; wrote proposal and managed project to completion \$12,000
"Enhancing the west coast regional deep-sea coral database"

SERVICE

COMMITTEES AND WORKING GROUPS

Data Management Working Group, NOAA Deep-Sea Coral Res. & Tech. Program

2010-present

Sustainability Committee, Hatfield Marine Science Center, Oregon State Univ.

2008-2011

PUBLICATIONS

PEER-REVIEWED PAPERS AND CHAPTERS

Keller, A.A., W.W. Wakefield, **C.E. Whitmire**, B.H. Horness, M.A. Bellman, and K.L. Bosley (2014) "Distribution of demersal fishes along the US west coast (Canada to Mexico) in relation to spatial fishing closures (2003-2011)." *MEPS*, doi:10.3354/meps10674.

Getsiv-Clemons, J.E.R. W.W. Wakefield, **C.E. Whitmire**, and I.J. Stewart (2012) "Identifying potential habitats from multibeam echosounder imagery to estimate abundance of groundfish: a case study at Heceta Bank, OR, USA." In: P.T. Harris and E.K. Baker (eds.) *Seafloor Geomorphology as Benthic Habitat: GeoHAB Atlas of Seafloor Geomorphic Features and Benthic Habitats*. Elsevier Inc., 570-586, ISBN: 978-0-12-385140-6.

Whitmire, C.E., R.W. Embley, W.W. Wakefield, S.G. Merle, and B.N. Tissot (2007) "A quantitative approach for using multibeam sonar data to map benthic habitats." In B. Todd and H.G. Greene (eds.) *Mapping the Seafloor for Habitat Characterization. Geological Association of Canada, Special Paper 47*, 111-126, ISBN: 978-1-897095-33-1.

Wakefield, W.W., **C.E. Whitmire**, J.E.R. Clemons, and B.N. Tissot (2005) "Fish habitat studies: Combining high-resolution geological and biological data." In: P.W. Barnes and J.P. Thomas (eds.) *Benthic habitats and the effects of fishing. American Fisheries Society Symposium 41*: 119-138, ISBN: 1-888569-60-3, ISSN: 0892-2284.

NON-REFEREED PAPERS

Clarke M.E., **C.E. Whitmire**, M.M. Yoklavich (2015) "State of Deep-Sea Coral and Sponge Ecosystems of the U.S. West Coast: 2015. In: Hourigan TF, Etnoyer PJ, Cairns SD (eds.) *The State of Deep-Sea Coral and Sponge Ecosystems of the United States: 2015. NOAA Tech. Memo.*, NOAA, Silver Spring, pp 5-1 – 5-42.

Hourigan, T.F., P.J. Etnoyer, R.P. McGuinn, **C. Whitmire**, D.S. Dorfman, M. Dornback, S. Cross, D. Sallis. (2015) *An Introduction to NOAA's National Database for Deep-Sea Corals and Sponges. NOAA Tech. Memo.*, NOS-NCCOS-191, 27 p.

Clarke, M.E., **C. Whitmire**, E. Fruh, J. Anderson, J. Taylor, J. Rooney, S. Ferguson, and H. Singh (2010) "Developing the SeaBED AUV as tool for conducting routine surveys of fish and their habitat in the Pacific." *Proceedings of the IEEE Conference on Autonomous Underwater Vehicles*, Sep 2010, Monterey, CA, USA, doi:10.1109/AUV.2010.5779665.

Whitmire, C.E. and M.E. Clarke (2007) "State of Deep Coral Ecosystems of the U.S. Pacific Coast: California to Washington." pp. 109-154. In: S.E. Lumsden, T.F. Hourigan, A.W. Bruckner, and G. Dorr (eds.) *The State of Deep Coral Ecosystems of the United States. NOAA Tech. Memo.*, CRCP-3, Silver Spring, MD, USA 365 p.

Helser, T.E., I.J. Stewart, **C.E. Whitmire**, and B.H. Horness (2007) "Model-based estimates of abundance for 11 species from the NMFS slope surveys." *NOAA Tech. Memo.*, NMFS-NWFSC-82, Seattle, WA, USA, 145 p.

OTHER PUBLICATIONS

National Marine Fisheries Service (2013) "Groundfish Essential Fish Habitat Synthesis: A Report to the Pacific Fishery Management Council." NOAA NMFS Northwest Fisheries Science Center, Seattle, WA, USA, Apr 2013, 110 p.

Pacific Fishery Management Council (2012) "Pacific Coast Groundfish 5-year Review of Essential Fish Habitat; Report to Pacific Fishery Management Council Phase 1: New Information, September 2012." Portland, OR, USA, 121 p.

PROFESSIONAL MEETINGS, SYMPOSIA, AND CONFERENCES

ORAL PRESENTATIONS TO PROFESSIONAL GROUPS

- Hourigan, T.F., **C.E. Whitmire**, C.N. Rooper. "U.S. Fisheries and Deep-Sea Coral Habitats: Policy, Science and Conservation." *6th International Symposium on Deep-Sea Corals*, 11-16 Sep 2016, Boston, MA.
- Stadler, J.H., W.W. Wakefield, K.F. Griffin, **C. Whitmire**, A. Bailey. "Revising the essential fish habitat conservation areas of the Pacific coast groundfish fishery management plan." *146th AFS Annual Meeting*, 21-25 Aug 2016, Kansas City, MO.
- Chappell, A., **C. Whitmire**, J. Harms, J. Benante, A. Keller. "Fine-scale benthic habitat classification as part of the Northwest Fisheries Science Center's (NWFSC) Southern California Hook and Line Survey". *19th Annual Western Groundfish Conference*, 8-12 Feb 2016, Newport, OR.
- Berger, A.M., J.T. Thorson, **C. Whitmire**. "A random-field approach for estimating abundance indices: estimation properties when using spatial covariates." *145th Annual Meeting of the American Fisheries Society*, 16-20 Aug 2015, Portland, OR.
- Clarke, M.E., E. Fruh, **C. Whitmire**, H. Singh, C. Roman, J. Taylor, J. Anderson, C. Kunz. "Experiences using autonomous technologies to survey fish populations." *145th Annual Meeting of the American Fisheries Society*, 16-20 Aug 2015, Portland, OR.
- Somers, K., YW Lee, J. McVeigh, J. Jannot, **C. Whitmire**, J. Hastie. "Fishing Effort before and during IFQ Management in WCGOP-Observed Fisheries." *145th Annual Meeting of the American Fisheries Society*, 16-20 Aug 2015, Portland, OR.
- Anderson, J., B. Richards, M.E. Clarke, J. Taylor, **C. Whitmire**, E. Fruh. "Utilizing high-tech. solutions to monitor fish and their habitats." *22nd Annual Hawai'i Conservation Conference*, 15-17 Jul 2014, Honolulu, HI.
- Chappell, A., M. Barnhart, J. Harms, J. Benante, **C. Whitmire**. "Classification of benthic habitat in the southern California Bight." *3rd NWFSC Science Symposium*, 25-26 Mar 2014, Seattle, WA.
- Yoklavich, M.M., W.W. Wakefield, C.G. Romsos, J.J. Bizzarro, **C.E. Whitmire**, M. Bellman. "Data Supporting a Review of Essential Fish Habitat for Pacific Groundfishes." *GeoHab 2012 – 11th International Symposium*, 1-4 May 2012, Orcas Island, WA.
- Wakefield, W.W., M.M. Yoklavich, C. Romsos, J.J. Bizzarro, **C.E. Whitmire**, M. Bellman. "Information to Support the Five-Year Review of Essential Fish Habitat for Pacific Coast Groundfish." *3rd NWFSC Science Symposium*, 14-15 Mar 2012, Seattle WA.
- Wakefield, W.W., M.M. Yoklavich, C. Romsos, J.J. Bizzarro, **C.E. Whitmire**, M. Bellman. "Information to Support the Five-Year Review of Essential Fish Habitat for Pacific Coast Groundfish." *17th Western Groundfish Conference*, 7-10 Feb 2012, Seattle WA.
- Bosley, K.L., K.M. Bosley, **C.E. Whitmire**, A.A. Keller. "Relating groundfish biomass, species richness and community structure to the presence of corals and sponges using NWFSC bottom trawl survey data." *17th Western Groundfish Conference*, 7-10 Feb 2012, Seattle WA.
- Clarke, M.E., Fruh, E., **C. Whitmire**. "Developing the SeaBED AUV to Monitor West Coast Groundfish and their Habitat." *Annual Meeting of the American Fisheries Society*, 4-8 Sep 2011, Seattle, WA.
- Clarke, M.E., **C. Whitmire**, C. Goldfinger. "Sponge Communities on the United States West Coast." *2nd International Marine Conservation Congress*, 13 May 2011, Victoria, BC.
- Clarke, M.E., **C. Whitmire**, E. Fruh, J. Anderson, J. Taylor, J. Rooney, S. Ferguson, H. Singh. "Developing the SeaBED AUV as a Tool for Conducting Routine Surveys of Fish and their Habitat in the Pacific." *IEEE/OES AUV Conference*, 1-3 Sep 2010, Monterey, CA.
- Haltuch, M.A., J. Hastie, A. Hicks, **C. Whitmire**. "Reconciling uncertain and conflicting trends in Petrale sole abundance." *National Stock / Habitat Assessment Workshop*, 17-20 May 2010, St. Petersburg, FL.

ORAL PRESENTATIONS TO PROFESSIONAL GROUPS (CONT.)

- Wakefield, W.W., J.E.R. Clemons, I.J. Stewart, **C.E. Whitmire**. "Using meso-habitat information to improve abundance estimates for west coast groundfish: A test case at Heceta Bank, OR." *National Stock / Habitat Assessment Workshop*, 17-20 May 2010, St. Petersburg, FL.
- Clemons, J.E.R., W.W. Wakefield, I.J. Stewart, **C.E. Whitmire**. "Using meso-habitat information to improve abundance estimates for West Coast groundfish: a test case at Heceta Bank, Oregon." *16th Western Groundfish Conference*, 26-30 Apr 2010, Juneau, AK.
- Clarke, M.E., D. Chu, O. Hamel, I. Stewart, N. Tolimieri, **C.E. Whitmire**. "Seabed AUV surveys: from research to operation." *National Stock Assessment Workshop-10*, 6-8 May 2008, Port Townsend, WA.
- Clemons, J.E.R., W.W. Wakefield, **C.E. Whitmire**, R.W. Embley, B.N. Tissot, S.G. Merle, C. Goldfinger and C.G. Romsos. "Habitat characterization of Heceta Bank, Oregon, USA for use in estimates of groundfish assemblages on the bank." *Geohab 2008 – 7th International Symposium*, 29 Apr – 2 May 2008, Sitka, AK.
- Whitmire, C.E.**, N. Tolimieri and M.E. Clarke. "Large-scale associations between habitat, fish and corals." *Third International Symposium on Deep-Sea Corals*, 28 Nov - 2 Dec 2005, Miami, FL.
- Clemons, J.E.R., W.W. Wakefield, **C.E. Whitmire**, B.N. Tissot, S.G. Merle. "Using video and sonar technologies with GIS tools to investigate fish habitat communities off the Oregon coast." *Annual Meeting of the American Fisheries Society and Lowell Wakefield Symposium on North Pacific Rockfishes*, 11-15 Sep 2005, Anchorage, AK.
- Wakefield, W.W. J.E.R. Clemons, B.N. Tissot, **C.E. Whitmire**, T.D. Hart, and R.W. Embley. "Habitat associations and diel activity in rockfishes on a deep-water bank off Oregon." *Annual Meeting of the American Fisheries Society and Lowell Wakefield Symposium on North Pacific Rockfishes*, 11-15 Sep 2005, Anchorage, AK.
- Whitmire, C.E.**, R.W. Embley, W.W. Wakefield, S.G. Merle, B.N. Tissot, N. Puniwai. "A quantitative approach for using multibeam sonar data to map benthic habitats." *GeoHab 2005 – 4th International Symposium*, 4-6 May 2005, Sidney, BC.
- Whitmire, C.E.**, R.W. Embley, W.W. Wakefield, S.G. Merle, B.N. Tissot, N. Puniwai. "Quantitative Benthic Habitat Characterization at Heceta Bank, Oregon." *148th Meeting of the Acoustical Society of America*, 15-19 Nov 2004, San Diego, CA.
- Wakefield, W.W., J.E.R. Clemons, and **C.E. Whitmire**. "The application of in situ video in groundfish research at the NWFSC: field and laboratory techniques." *National Marine Fisheries Service Workshop on the Analysis of Underwater Video Observations*, 4-6 Aug 2004, Seattle, WA.
- Clemons, J.E.R., W.W. Wakefield, R.W. Embley, B.N. Tissot, M.M. Yoklavich, S.G. Merle, **C.E. Whitmire**, and W.H. Barss. "Microhabitat studies of groundfish at Heceta Bank, a rocky reef offshore Oregon." *GeoHab 2004 – Marine Geological and Biological Habitat Mapping*, 5-7 May 2004, Galway, Ireland.
- Whitmire, C.E.**, R.W. Embley, W.W. Wakefield, S. Merle, B. N. Tissot., N. Puniwai. "Using remote sensing, in situ observations, and geographic information systems to map benthic habitats at Heceta Bank, Oregon." *Western Groundfish Conference*, 9-13 Feb 2004, Victoria, BC.
- Clemons, J.E.R., W.W. Wakefield, R.W. Embley, B.N. Tissot, M.M. Yoklavich, T.D. Hart, S.G. Merle, **C.E. Whitmire**, and W.H. Barss. "Fish habitat studies at Heceta Bank on the Oregon continental shelf." *Western Groundfish Conference*, 9-13 Feb 2004, Victoria, BC.
- Tissot, B.N., W.W. Wakefield, M.A. Hixon, D.L. Stein, W.H. Barss, N. Puniwai, K. York, and **C.E. Whitmire**. "Long-term habitat-based assessment of changes in groundfish populations on Heceta Bank, Oregon derived from submersible surveys." *Western Groundfish Conference*, 9-13 Feb 2004, Victoria, BC.

POSTER PRESENTATIONS

- Singh, H. M.E. Clarke, E. Fruh, J. Anderson, **C. Whitmire**, J. Taylor. "Using autonomous technologies to expand observations of fish, invertebrates, and their associated habitats." *2016 Ocean Sciences Meeting*, 21-26 Feb 2016, New Orleans, LA.
- Hourigan, T.F., R.P. McGuinn, M. Dornback, P.J. Etnoyer, **C.E. Whitmire**, S.L. Cross, D.E. Sallis, E.J. Schenck-Gardner, L. Collazo, T.P. Lewis, E.J. Salgado. "Linking science to management: NOAA's deep-sea coral and sponge database and map portal." *14th Deep-Sea Biology Symposium*, 30 Aug – 3 Sep, 2015, Aveiro, Portugal.
- Wakefield, W.W., M.M. Yoklavich, C.G. Romsos, J.J. Bizzarro, **C.E. Whitmire**, M. Bellman. "A Review of Essential Fish Habitat for Pacific Coast Groundfish." *Managing Our Nations Fisheries 3 Conference*, 7-9 May 2013, Washington, DC.
- Wakefield, W.W., M.M. Yoklavich, C.G. Romsos, J.J. Bizzarro, **C.E. Whitmire**, M. Bellman. "Data to Support a Review of Essential Fish Habitat for Pacific Coast Groundfish." *Oregon Marine Renewable Energy Environmental Science Conference*, 28-29 Nov 2012, Corvallis, OR.
- Wakefield, W.W., M.M. Yoklavich, C.G. Romsos, J.J. Bizzarro, **C.E. Whitmire**, M. Bellman. "Data to support a review of essential fish habitat for Pacific Coast Groundfish." *National Habitat Assessment Workshop*, 5-7 Sep 2012, Seattle WA.
- Whitmire, C.E.**, M.E. Clarke, J.D. Hastie, B. Horness, A.A. Keller. "Catch composition in the NMFS west coast bottom trawl survey as a predictor of habitat complexity." *National Stock / Habitat Assessment Workshop*, 17-20 May 2010, St. Petersburg, FL.
- Whitmire, C.E.** and M.E. Clarke. "Identifying coral habitat areas that are potentially vulnerable to fishing interactions." *National Stock / Habitat Assessment Workshop*, 17-20 May 2010, St. Petersburg, FL.
- Clarke, M.E., E. Fruh, **C.E. Whitmire**, H. Singh. "AUV for Monitoring Fish and their Habitat on the U.S. West Coast." *National Stock / Habitat Assessment Workshop*, 17-20 May 2010, St. Petersburg, FL.
- Clemons, J.E.R., W.W. Wakefield, I.J. Stewart, **C.E. Whitmire**. "Estimating biomass from in situ counts of demersal fishes – the challenge in creating a random sample from data collected non-randomly." *National Stock / Habitat Assessment Workshop*, 17-20 May 2010, St. Petersburg, FL.
- Clemons, J.E.R., W.W. Wakefield, I.J. Stewart, **C.E. Whitmire**. "Estimating biomass from in situ counts of demersal fishes – the challenge in creating a random sample from data collected non-randomly." *16th Western Groundfish Conference*, 26-30 Apr 2010, Juneau, AK.
- Bellman, M.A. and **C.E. Whitmire**. "Science to support complex decisions: US west coast groundfish fisheries." *2nd NWFSC Science Symposium*, 25 Feb 2009, Northwest Fisheries Science Center, Seattle, WA.
- Bellman, M.A. and **C.E. Whitmire**. "Science to support complex decisions: US west coast groundfish fisheries." *ESRI International User's Conference*, 4-8 Aug 2008, San Diego, CA.
- Whitmire C.E.** and M.E. Clarke. "Census of deep-sea/cold-water corals off the western coast of the United States." *Annual Meeting of the North Pacific Marine Science Organization (PICES)*, 26 Oct – 5 Nov 2007, Victoria, BC.
- Whitmire, C.E.**, M.A. Bellman, J.D. Hastie. "Comparison of methods for estimating trawled area." *14th Western Groundfish Conference*, 30 Jan – 3 Feb 2006, Newport, OR.
- Whitmire, C.E.**, M.E. Clarke, W.W. Wakefield. "Mapping the distribution of cold-water corals and sponges off the U.S. West Coast." *GeoHab 2005 – 4th International Symposium*, 4-6 May 2005, Sidney, BC.
- Whitmire, C.E.** and M.E. Clarke. "Mapping the distribution of structure-forming invertebrates off the U.S. West Coast." *Managing Our Nations Fisheries 2 Conference*, 24-26 Mar 2005, Washington, DC.
- Whitmire, C.E.**, M.E. Clarke, W.W. Wakefield, M.A. Hixon. "Mapping the distribution of structure-forming invertebrates off the U.S. West Coast." *Annual Meeting of the North Pacific Marine Science Organization (PICES)*, 18-22 Oct 2004, Honolulu, HI.

POSTER PRESENTATIONS (CONT.)

- Whitmire, C.E.**, W.W. Wakefield, R. Methot, B.N. Tissot, A. Bailey, L. Yengoyan, and C. Hansen. "Relating high-resolution submersible observational data to regional trawl survey data – a work in progress." *Western Groundfish Conference*, 9-13 Feb 2004, Victoria, BC.
- Whitmire, C.E.**, R.W. Embley, J.E.R. Clemons, S. Merle, N. Puniwai, B.N. Tissot, W.W. Wakefield, and M.M. Yoklavich. "Integration of high-resolution multibeam sonar imagery of the seafloor with direct observational data from occupied submersibles and ROVs to classify bottom types for habitat-based groundfish assessments at Heceta Bank, Oregon." *GeoHab 2002*, 1-3 May 2002, Moss Landing, CA.
- Wakefield, W.W., R.W. Embley, B.N. Tissot, M.M. Yoklavich, W.H. Barss, J. Bloeser, K.L. Bosley, J.E.R. Clemons, G.L. Hendler, M.A. Hixon, S. Merle, N.M. Nasby, J. Popp Noskov, N. Puniwai, D. Reese, Á. Valdés and **C.E. Whitmire**. "Fisheries habitat studies at Heceta Bank on the Oregon outer continental shelf: Combining high-resolution sonar and seafloor investigations with GIS techniques." *GeoHab 2002*, 1-3 May 2002, Moss Landing, CA.
- Whitmire, C.E.**, R.W. Embley, J.E.R. Clemons, S. Merle, N. Puniwai, B.N. Tissot, W.W. Wakefield, and M.M. Yoklavich. "Integration of high-resolution multibeam sonar imagery of the seafloor with direct observational data from occupied submersibles and ROVs to classify bottom types for habitat-based groundfish assessments at Heceta Bank, Oregon." *Western Groundfish Conference*, 12-14 Feb 2002, Ocean Shores, WA.
- Wakefield, W.W., J.E.R. Clemons, W.H. Barss, J. Bloeser, K.L. Bosley, R.W. Embley, G.L. Hendler, M.A. Hixon, S. Merle, N.M. Nasby, J. Popp Noskov, N. Puniwai, D. Reese, B.N. Tissot, Á. Valdés, **C.E. Whitmire** and M.M. Yoklavich. "Fisheries habitat studies at Heceta Bank on the Oregon outer continental shelf: combining high-resolution sonar and seafloor investigations with GIS techniques." *Western Groundfish Conference*, 12-14 Feb 2002, Ocean Shores, WA.
- Clemons, J.E.R., S. Merle, E. Baker, J. Bloeser, K.L. Bosley, E. Bowlby, M.S. Brancato, R.D. Brodeur, D. Douglas, R.W. Embley, R.L. Emmett, C. Goldfinger, G.L. Hendler, B. Myers, J. Popp Noskov, W.G. Pearcy, N. Puniwai, J. Resing, B.N. Tissot, W. Wakefield, **C.E. Whitmire**, K.L. Yamanaka and M.M. Yoklavich. "Continuing Lewis and Clark's Legacy: Exploring the habitats of Astoria Canyon, Oregon through NOAA's new Program in Ocean Exploration." *Western Groundfish Conference*, 12-14 Feb 2002, Ocean Shores, WA.
- Whitmire, C.E.**, R.W. Embley, J.E.R. Clemons, S. Merle, N. Puniwai, B.N. Tissot, W.W. Wakefield, and M.M. Yoklavich. "Integration of high-resolution multibeam sonar imagery of the seafloor with direct observational data from occupied submersibles and ROVs to classify bottom types for habitat-based groundfish assessments at Heceta Bank, Oregon." *2002 Ocean Sciences Meeting*, 11-15 Feb 2002, Honolulu, HI.
- Wakefield, W.W., J.E.R. Clemons, W.H. Barss, J. Bloeser, K.L. Bosley, R.W. Embley, G.L. Hendler, M.A. Hixon, S.G. Merle, N.M. Nasby, J. Popp Noskov, N. Puniwai, D. Reese, B.N. Tissot, Á. Valdés, **C.E. Whitmire** and M.M. Yoklavich. "Continuing Lewis and Clark's Legacy: Exploring the Habitats of Astoria Canyon, Oregon through NOAA's new Program in Ocean Exploration." *2002 Ocean Sciences Meeting*, 11-15 Feb 2002, Honolulu, HI.

PARTICIPATION AT INVITATIONAL WORKSHOPS

- Whitmire, C.E.**, M.E. Clarke, M.M. Yoklavich. "Deep-Sea Corals and Sponges as Vulnerable Marine Ecosystems (VMEs) off the U.S. West Coast." *Workshop on VMEs and fishing interactions (part of a Joint NOAA-Korea Agreement)*, 22-24 Aug 2013, Busan Korea (Oral presentation).
- Whitmire, C.E.** and J. Harms. "Overview of NWFSC Groundfish Habitat Programs." *Dept. of Fisheries and Oceans GIS-Habitat Workshop*, 28-29 Mar 2006, Richmond, BC (Oral presentation).

FIELD EXPERIENCE

Project/Duties	Vessel	Date
<u>NOAA Fisheries Untrawable Habitat Cruise</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	NOAA Ship <i>Reuben Lasker</i>	Oct 2016
<u>NOAA Deep-Sea Coral Research & Technology Cruise</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	R/V <i>Shearwater</i>	Aug 2016
<u>NOAA-NWFSC Northern California Current Ecosystem Survey</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	NOAA Ship <i>Bell M. Shimada</i>	Sep 2015
<u>NOAA Fisheries Untrawable Habitat Cruise</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	R/V <i>Weatherbird II</i>	Jul 2015
<u>NOAA-PIFSC Fisheries Research Cruise</u> Planned AUV missions, assisted in assembly, launch and recovery of AUV	NOAA Ship <i>Oscar Elton Sette</i>	Apr 2014
<u>NOAA-PIFSC Fisheries Research Cruise</u> Planned AUV missions, assisted in assembly, launch and recovery of AUV	NOAA Ship <i>Oscar Elton Sette</i>	Apr 2013
<u>Joint Fisheries & Oceans Canada - NOAA Deep-Sea Coral Research & Technology Cruise</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV.	Canadian CG Ship <i>John P. Tully</i>	Jul 2012
<u>NOAA-PIFSC Reef Fish Methods Comparison Cruise</u> Planned AUV missions, assisted in assembly, launch and recovery of AUV	NOAA Ship <i>Oscar Elton Sette</i>	Apr 2012
<u>NOAA Deep-Sea Coral Research & Technology Cruise</u> Selected dive sites, planned AUV missions, assisted in assembly of AUV	R/V <i>Fulmar</i>	Aug 2011
<u>Joint Fisheries & Oceans Canada - NOAA Deep-Sea Coral Research & Tech Cruise</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	Canadian CG Ship <i>John P. Tully</i>	Jul 2011
<u>NOAA Deep-Sea Coral Research & Technology Cruise</u> Selected dive sites, assisted in assembly of AUV.	R/V <i>Pacific Storm</i>	Sep-Oct 2010
<u>NOAA Deep-Sea Coral Research & Technology Cruise</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	NOAA Ship <i>McArthur II</i>	Jun-Jul 2010
<u>Seabed AUV Testing</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	R/V <i>Shearwater</i>	Apr 2010
<u>NOAA-PIFSC Marine Resource Survey</u> Planned AUV missions, assisted in assembly, launch and recovery of AUV	NOAA Ship <i>Oscar Elton Sette</i>	Feb 2010

FIELD EXPERIENCE

Project/Duties	Vessel	Date
<u>Seabed AUV Testing</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	R/V <i>Shearwater</i>	Sep-Oct 2009
<u>Seabed AUV Testing</u> Planned AUV missions, assisted in assembly, launch and recovery of AUV	R/V <i>Huki Pono</i>	Aug-Sep 2009
<u>Seabed AUV Testing</u> Selected dive sites, planned AUV missions, assisted in assembly, launch and recovery of AUV	R/V <i>Shearwater</i>	Mar 2009
<u>NOAA-NWFSC Southern California Hook-and-Line Survey</u> Assisted in survey design and deck operations	P/V <i>Mirage</i>	Sep 2008
<u>NOAA-NWFSC Southern California Hook-and-Line Survey</u> Assisted in survey design and deck operations	P/V <i>Mirage</i>	Oct 2007
<u>NOAA-NWFSC Acoustics Survey of Pacific hake</u> Assisted in fish sample processing	NOAA Ship <i>Miller Freeman</i>	Jun 2007
<u>NOAA-NWFSC Southern California Hook-and-Line Survey</u> Assisted in survey design and deck operations	P/V <i>Aggressor</i>	Oct 2006
<u>Olympic Coast NMS Survey of Coral/Sponge Resources</u> Assisted in annotation of ROV video and specimen collection	NOAA Ship <i>McArthur II</i>	May-Jun 2006
<u>NOAA-NWFSC Southern California Hook-and-Line Survey</u> Assisted in survey design and deck operations	P/V <i>Aggressor</i>	Sep-Oct 2005
<u>NOAA-NWFSC Advanced Technology Cruise</u> Assisted in deck operations for AUV and camera sled	R/V <i>Thomas G. Thompson</i>	Oct 2005
<u>NOAA-NWFSC Advanced Technology Cruise</u> Assisted in annotation of ROV video and specimen collection	R/V <i>Thomas G. Thompson</i>	Oct 2004
<u>NOAA-NWFSC Acoustics Survey of Pacific hake</u> Assisted in fish sample processing	Canadian CG Ship <i>W.E. Ricker</i>	Jul 2003
<u>Heceta Bank Submersible Cruise</u> Assisted in dive operations and annotation of submersible video	R/V <i>Velero IV</i>	Sep 2002
<u>NOAA Ocean Exploration - Continuing the Legacy of Lewis & Clark</u> Assisted in multibeam sonar data processing	R/V <i>Thomas G. Thompson</i>	Aug 2002
<u>NOAA Ocean Exploration - Lewis & Clark Legacy Expedition</u> Assisted in annotation of ROV video	R/V <i>Thomas G. Thompson</i>	Jun-Jul 2001
<u>NOAA-NURP Heceta Bank ROV Cruise</u> Assisted in annotation of ROV video	NOAA Ship <i>Ronald H. Brown</i>	Jun 2000